

PREHISTORIC MAMMALIAN FAUNA FROM THE COROMANDEL PENINSULA

IAN W.G. SMITH

UNIVERSITY OF OTAGO

Abstract. Mammalian fauna from excavations at Opito (N40/3), Sarahs Gully (N40/9) and five nearby sites is described and aspects of prehistoric economy reconstructed. Dogs were the most abundant and consistently occurring species, but throughout the period A.D. 1200-1500 sea mammals contributed a greater quantity of meat to the diet. Comparisons with several contemporary North Island sites show similar patterns and suggest a decline in sea mammal exploitation after the 15th or 16th century.

One of the most concerted and fruitful periods of archaeological research on the Coromandel Peninsula, North Island, New Zealand, took place between 1956 and 1960. Excavations were concentrated on a group of sites just to the north of Mercury Bay (Fig. 1), and yielded a body of data of considerable importance in developing the understanding of early Polynesian occupation in the North Island. These excavations were, among other things, central to Golson's defining of Archaic material culture in the North Island (Golson 1959b), and to the eventual acceptance of horticulture as within the range of Archaic economic pursuits (Green 1972a, 1972b).

The sites fall into two broad types; beach middens, and sites with kumara storage pits. The excavated sites and others in the vicinity appear to form a consistent distributional pattern, with the pit complexes located on low ridges immediately behind the coastal middens. The two site types are generally thought to be related components of a single settlement pattern (Green 1972b). The economic activities of their inhabitants seem to have been wide ranging. The growing of kumara, and perhaps other cultigens, is indicated by the storage structures, and the associated middens are reported to have contained a wide range of both extinct and extant fauna (Green 1963, Davidson 1979). However, the faunal material from most of these sites has received little more than the most cursory examination. Thus it has not been possible to document accurately the range of economic activities undertaken and their relative importance. In this paper the mammalian fauna from these sites is analysed with a view to clarifying at least part of the economic system of the prehistoric inhabitants of this area. The material under analysis derives from several excavations (described below) and is now housed in the Auckland Museum.

THE ASSEMBLAGES

Analysis of faunal remains excavated some twenty years ago presents problems above and beyond those normally encountered in the study of prehistoric economies. Records of some of these excavations are now incomplete and thus the interpretation of stratigraphy is difficult. The major problem arising in this study concerns the pooling of faunal material into assemblages that can reasonably be expected to represent discrete periods of occupation. For some of the sites this is not difficult, as sufficient stratigraphic

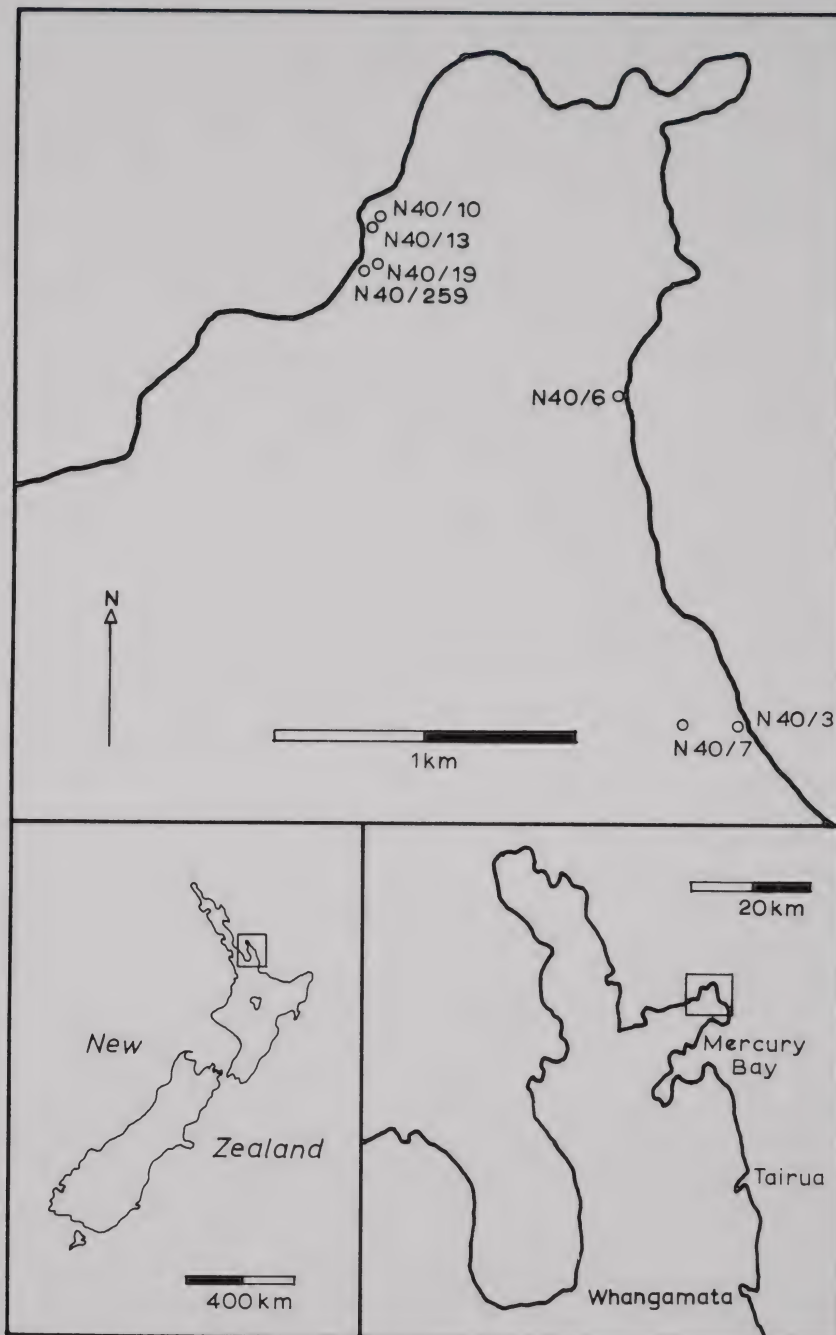


Fig. 1. Location of sites.

information is available. For others this is not so, and the following interpretations employ the information that is available combined with some estimation. The assemblages under analysis are summarised as follows.

Opito (N40/3)

This site was excavated in 1957-58 by Golson (1959a, 1959b). The material under analysis derives from seven layers which have been combined into four occupation levels. Level I is composed of layers 2 and 3, which represent the latest period of occupation at the site (Green 1963:59). Mammalian fauna was present only in layer 3.

Layer 4 is subdivided into three deposits — 4a, 4b and 4c — which together are assigned to the Archaic period (Golson 1959a: 18). Each of these has been treated as a separate level. An argument could be made for combining layers 4a and 4b, as during the process of identifying bone from these layers part of a broken dog pelvis from 4a was found to connect with a portion from 4b, raising the possibility of continuity of occupation between the two layers. Furthermore Green (1964), in his study of Coromandel obsidians, combined 4a and 4b although his reasons for doing so were not made clear. However, as recent analyses of other site components have treated these layers as discrete assemblages (e.g. Boileau 1980), and as the observed bone matching could be accounted for by intra-site disturbance, each of these layers will be treated separately.

Layers 5, 6 and 7 must be assumed to lie beneath layer 4, although they are not described in any of the published accounts of the stratigraphy. As these contained very little material, and as layer 4c was described as an occupation "spread at the bottom of the deposit" (Green 1963:60), the lower layers have been included with 4c in level IV.

The pooling of layers into occupation levels is summarised as follows:

- Level I — Layers 2 and 3
- Level II — layer 4a
- Level III — layer 4b
- Level IV — layers 4c, 5, 6 and 7.

Arthur Black's Midden (N40/6), Opito

Little is known of investigations in this site, undertaken in 1958 (Golson 1959a). The stratigraphy has not been described, but as faunal material from two layers was present, each was treated as a separate assemblage.

Skippers Ridge (N40/7), Opito

Parker's excavations at Skippers Ridge have been described in detail elsewhere (Parker 1960, Davidson 1975). The five layers of this complex site have previously been grouped into four occupation levels (Davidson 1975: Table 1). The faunal material under analysis here derives from layer 2 (Occupation IV) and layer 4 (Occupation I). Further mammalian bone was reported from layer 3 (Occupation III) (Parker 1960:41) but was not present in the collection analysed here.

Saraha's Gully Settlement (N40/9)

Excavations undertaken by Golson between 1956 and 1959 (Golson 1959a) concentrated on a number of areas within this large site. These will be analysed separately.

a. *Areas A and B.* These two contiguous areas on the edge of a terrace behind the beach had up to ten stratified layers (Green 1963:65). There is no direct evidence which permits pooling of these layers into occupation levels, although a change of emphasis from rocky shore to mudflat shellfish species between the lower five and upper five layers (*ibid.*) does suggest that the sequence could be divided into two broad periods. The distribution of cetacean bone, both horizontally and vertically within the site provides a further possible basis for pooling. All the cetacean bones appear to be from a single species, the pilot whale (*Globicephala melaena*), and fall into three concentrations within the site. A few small cranial and vertebral fragments occurred in layers 1, 2 and 3, and were all concentrated within three adjacent squares near the middle of the excavated area. On the seaward edge of the midden a concentration of rib bones was found in layers 6 and 7, and a concentration of cranial bones in layer 9. The relative scarcity of bones of this species in the site and their apparent spatial proximity suggests that each concentration represents bones of a single individual. Whether their distribution through a number of layers indicates that these layers belong to a single period of occupation, or results from internal disturbance of the stratigraphy cannot be established. In either case the pooling of these sets of layers would appear to be a wise procedure. On this basis the material has been grouped into four levels as follows:

Level I — layers 1, 2 and 3

Level II — layers 4 and 5

Level III — layers 6 and 7

Level IV — layers 8, and 9 and natural.

b. *Area C.* Five layers were present in this area, but only the lower three contained mammalian fauna. Each has been treated as a separate assemblage.

c. *Area D.* Material from the surface and four underlying layers was present and each has been analysed separately.

Cross Creek Midden (N40/259)

During excavations at Sarahs Gully, material was collected from this midden across the stream from the main site (Davidson pers. comm.). As it was not excavated by stratigraphic techniques the material will be treated as a single assemblage.

Sarahs Gully Pa (N40/10)

Excavations at this site in 1959 and 1960 were directed by L. and H. Birks. Three periods of occupation have been identified (Birks & Birks 1960), but unfortunately the material under analysis, from layers 2, 3 and 4, could not be correlated with these. Each layer was examined separately.

Sarahs Midden (N40/13)

Sarahs Midden was excavated during the course of investigations at Sarahs Gully Pa. Two distinct occupation levels are reported from this site (Green 1963:67). The material under analysis derives from layers 2, 3, 4 and 5. Of these layers 3 and 5 contained the bulk of the faunal material and have been interpreted as the occupation levels referred to above.

The material from the other two layers — three bone fragments from layer 2, and two from layer 4 — has been combined with that from the primary layers in the following manner:

Level I — layers 2 and 3.

Level II — layers 4 and 5.

DATING OF THE ASSEMBLAGES

Radiocarbon dates are available for only four of the sites, and for only some of the levels within each of these. Summaries of these dates may be found elsewhere (Green 1963, 1972b, Davidson 1974). The absence of radiocarbon estimates for many of the assemblages and problems of interpretation of some of the available dates prohibit construction of a detailed relative chronology. However, with the exception of three or four assemblages, all the material appears to derive from the period A.D. 1200-1500. The earliest secure date — A.D. 1170 + 60-50 (N.Z. 1740; Davidson 1974) — is for Occupation I at Skippers Ridge. A slightly earlier date from Area A at Sarahs Gully is considered unreliable as the sample may have consisted of old wood (Green 1963:66). Phase I at Sarahs Gully Pa is dated to the mid-13th century, and Sarahs Gully Settlement and level IV at Opito to the 14th century (*ibid.*:60-66). Although not dated, the Cross Creek Midden, Blacks Midden, levels II and III at Opito, and level II at Sarahs Midden are also likely to fall within this period. Phases II and III at Sarahs Gully Pa are dated to the 16th and 17th centuries respectively. Occupation IV at Skippers Ridge and Level I at Opito may also be of this age. The end of the sequence is marked by level I at Sarahs Midden, which contained evidence of European contact (*ibid.*:67).

METHODS OF ANALYSIS

A number of the assemblages had been sorted into major faunal components and the material partially identified prior to this analysis. To maintain a comparable standard of faunal analysis all material, whether sorted and identified or not, was subjected to the same treatment.

All bone material was examined and mammalian fauna, other than rat, extracted. This was then sorted into four major categories — dog, seal, cetacean, and unidentifiable mammalian bone. Identification to species level (where possible) was undertaken by comparison with reference specimens in the Anthropology Department, University of Otago. The fragmentary nature of much of the cetacean bone, inadequacies in the available reference sample, and close osteological similarities between species prevented accurate identification of much of the cetacean material. The material was then identified to skeletal element, side of the body (where relevant), and portion of the bone present. The minimum number of individuals (MNI) for each species in each assemblage was calculated from the most frequently occurring skeletal element. Proportional body parts representation (BPR) was determined from the relative frequency of each skeletal element.

The ages of dogs were estimated from tooth eruption and epiphyseal fusion following the methods outlined by Allo (1970). Age and sex in fur seals were estimated from epiphyseal fusion and bone dimensions (Smith n.d.). Tooth wear and dental abnormalities in dogs were also assessed, using the methods described by Allo (1971).

In order to establish the relative importance of mammalian species in the economy the weight of meat provided by each animal was calculated. This was undertaken only for those assemblages with sufficiently large numbers to make comparisons meaningful. The basis for these calculations is discussed more fully elsewhere (Smith n.d.), but will be summarised briefly here. The average live body weights, estimated available meat weights and meat weights of various body parts for the relevant age and sex related groups in the species under consideration are listed in Table 1. For most species there was no indication of the age and sex of some individuals, and weights mid-way through the size range were employed for these. The unidentifiable cetaceans appeared to be of a similar size to the identified pilot whales, and the figures for that species have been applied to all the cetaceans. Analysis of the fur seal (*Arctocephalus forsteri*) BPR indicated that in some assemblages various individuals were represented by only part of the carcass. Hence meat weights were calculated only for those body parts present. The elephant seal (*Mirounga leonina*) and cetacean remains also appeared to represent partial carcasses, although problems of identification prevented establishing which body parts were present. In these instances an arbitrary figure of 10% of the available meat weight was employed to represent the weight of meat consumed. While such a procedure is clearly less than desirable, it can be justified on a number of grounds. The limited quantity of bone by which each of these species is represented suggests strongly that complete carcasses were not consumed, and thus employing complete carcass weights would grossly over-represent their economic importance. Individuals of both these species are very large — an adult pilot whale weighing approximately 1360 kg, and a subadult male elephant seal about 500 kg — and in the event of their capture disposal of a carcass before it rotted is likely to have presented problems to a small group of people. The sharing of meat with neighbouring or related groups of people may well have occurred in such situations, and

Table 1. Body weights and meat weights of selected mammals.

Species/age group	body weight (kg)	meat weight (kg)	meat weight (kg)	
			forelimb	hindlimb
<i>Dog (Canis familiaris)</i>				
juvenile	5.0	3.0		
subadult	10.0	6.0		
adult	12.5	7.5		
no indication	10.0	6.0		
<i>Fur seal (Arctocephalus forsteri)</i>				
pup	8.6	4.82		
juvenile	25.0	14.38	2.16	
subadult male	100.0	59.00	8.85	5.90
adult female	50.0	30.00	4.50	
adult male	150.0	94.50	14.18	9.45
no indication	75.0	44.25	6.64	
<i>Elephant seal (Mirounga leonina)</i>				
subadult male	500.0	276.25		
<i>Sea lion (Phocarctus hookeri)</i>				
adult male	225.0	141.75		
<i>Pilot whale (Globicephala melaena)</i>				
no indication	1360.0	829.60		

for this reason a partial carcass weight is to be preferred. An alternative means of prolonging the usefulness of a large animal carcass would have been through drying or some other means of preservation. It is not possible to determine whether such practices were undertaken at these sites, and thus the partial carcass weights may under-represent the true dietary value of these species.

RESULTS

Minimum numbers of individuals

The minimum number of individuals represented in each assemblage is shown in Table 2. The polynesian dog, *Canis familiaris*, was the most common species, occurring in every assemblage and making up just over half (55.44%) of the identified individuals. A quarter (25.74%) of the animals were fur seals. These were present in about half of the 25 assemblages. Cetaceans occurred in a greater number of assemblages, but made up a smaller total number of individuals as there was never more than one per assemblage. In only six instances was it possible to identify the cetaceans to species. The individual from Opito level IV, the three from Areas A and B at Sarahs Gully, and those from Sarahs Gully C layer 3 and Sarahs Gully D layer 3 were all Pilot whales. The remaining cetaceans were represented by remains too few and fragmentary to permit accurate identification. The two remaining species were extremely rare. A single New Zealand sea lion (*Phocarcus hookeri*) occurred in level II of Sarahs Midden, and elephant seal remains were found in four assemblages.

Dogs

The ages at death of dogs are shown in Table 3. Only 55% of the identified individuals were able to be aged, as the major limb bones essential for establishing age by epiphyseal fusion were frequently incomplete or absent. This reduces the confidence which can be placed in any conclusions drawn from these results, however there is a strong indication that dogs most frequently killed before reaching maturity. Just over one quarter of the aged dogs were adult (>18 months), with the two immature age groups making up 72.41%. This figure is considerably greater than the 20-40% of immature dogs which Allo found in North Island Archaic sites (Allo 1971: 121), but with nearly half of the identified individuals unaged it would be unwise to read too much into this difference. Nevertheless these results do support Allo's conclusion that killing immature dogs was relatively more common during the Archaic period than it was later.

The study of tooth wear (Table 4) also supports Allo's findings, confirming the absence of extreme wear in North Island Archaic dogs (ibid.:123). The range of wear observed is almost identical to that recorded by Allo for the Whangamata Wharf site (N49/2) and Houhora (N6/4), and Smith for Pig Bay (N38/21) (Allo 1971: Table 4, Smith 1981: Table 4).

Two incidences of abnormalities in the dentition of dogs were observed. Both were found on individuals in level III at Opito, and occurred in the mandibular dentition. One involved a supernumerary P1 alveolus, and the other a supernumerary M3 alveolus. Both of these have been recorded previously in the Maori dog (Allo 1971: Table 7). Two further recorded incidences of abnormality from this group of sites — a supernumerary P1 alveolus from Sarahs Gully, and premortem loss of a right mandibular P4 at Opito (ibid.: Table 7, Table 5) — were not able to be located in the material under study.

Table 2. Minimum numbers of individuals.

Assemblage	dog	fur seal	cetacean	elephant seal	sea lion	total
<hr/>						
Opito						
level I	1	1	1			3
level II	4	2	1			7
level III	5	5		1		11
level IV	9	9	1	1		20
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Total	19	17	3	2		41
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Blacks midden						
layer 2	1	1	1			3
layer 3	2	1				3
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Total	3	2	1			6
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Skippers Ridge						
occ. IV	1			1		2
occ. I	1					1
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Total	2			1		3
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Sarabs Gully A&B						
level I	2		1			3
level II	1					1
level III	3		1			4
level IV	2		1			3
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Total	8		3			11
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Sarabs Gully C						
layer 3	1		1			2
layer 4	2	1	1			4
layer 5	2	1	1			4
<hr/>						
Total	5	2	3			10
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Sarabs Gully D						
surface	1	1	1			3
layer 1	1					1
layer 2	1					1
layer 3	1		1			2
layer 4	2	1		1		4
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Total	6	2	2	1		11
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Cross Creek Midden						
Total	8	2	1			11
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Sarabs Gully Pa						
layer 2	1					1
layer 3	1		1			2
layer 4	1					1
<hr/>						
Total	3		1			4
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Sarabs Midden						
level I	1					1
level II	1	1			1	3
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Total	2	1			1	4

Table 3. Age of dogs at death.

Assemblage	juvenile	subadult	adult	no indication	total
Opito					
level I				1	1
level II		1	2	1	4
level III	1		1	3	5
level IV	1	2	2	4	9
Total	2	3	5	9	19
Blacks Midden					
layer 2		1			1
layer 3		1	1		2
Total		2	1		3
Skippers Ridge					
Occ. IV				1	1
Occ. I				1	1
Total				2	2
Sarahs Gully A&B					
level I		1		1	2
level II				1	1
level III		2		1	3
level IV	1	1			2
Total	1	4		3	8
Sarahs Gully C					
layer 3		1			1
layer 4	1			1	2
layer 5		1		1	2
Total	1	2		2	5
Sarahs Gully D					
surface				1	1
layer 1				1	1
layer 2				1	1
layer 3				1	1
layer 4		1		1	2
Total		1		5	6
Cross Creek Midden					
Total	3	1	1	3	8
Sarahs Gully Pa					
layer 2			1		1
layer 3	1				1
layer 4				1	1
Total	1		1	1	3
Sarahs Midden					
level I			1		1
level II				1	1
Total			1	1	2

Table 4. Tooth wear in dogs.

Assemblage	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Opito										
level I			1							
level II				1						
level III				2	1	1	1			
level IV			1	2		1	2	1		
Skippers Ridge										
occ. IV			1							
Sarahs Gully A&B										
level I				1						
level III			1		2					
level IV		1		1						
Sarahs Gully C										
layer 3					1					
layer 4				1						
layer 5				1	1					
Sarahs Gully D										
surface								1		
layer 1								1		
layer 3						1				
layer 4			1							
Cross Creek Midden										
		1	1	2	1	1	1	1		
Sarahs Gully Pa										
layer 2			1							
layer 3				1						
Sarahs Midden										
level I				1						
level II				1						

Sea mammals

The placing of fur seals into age-sex groups (Table 5) was more successful than the ageing of dogs. Only 15% were not able to be categorised. Once again an emphasis on subadult age groups was apparent, with 75% of the aged individuals belonging to the pup, juvenile and subadult male groups. The latter two were most common.

A wide range of age-sex groups were found only in levels III and IV at Opito. The presence of an adult female and a foetal pup in level III indicate that there may have been a fur seal breeding colony in the vicinity of the site, as these two age-sex groups are seldom found far from such colonies (Smith 1976: 16,17). The absence of pups and females in any of the other assemblages does raise the possibility that their occurrence at Opito may have resulted from the isolated straying of a pregnant female beyond the normal breeding

Table 5. Age and sex of fur seals.

Assemblage	pup	juv.	subad.male	ad.female	ad.male	no indic.	total
Opito							
level I						1	1
level II		1	1				2
level III	1	1	1	1		1	5
level IV		2	4		3		9
Total	1	4	6	1	3	2	17
Blacks Midden							
layer 2		1					1
layer 3			1				1
Total		1	1				2
Sarabs Gully C							
layer 4						1	1
layer 5		1					1
Total		1				1	2
Sarabs Gully D							
surface						1	1
layer 4		1					1
Total		1				1	2
Cross Creek Midden							
Total			1		1		2
Sarabs Midden							
level II		1					1
Total		1					1

range. However, pups have also been identified from Tairua (N44/2), some 35 km to the south of Opito (Smith 1978:22), which strengthens the case for fur seals breeding in the Coromandel area during the prehistoric period. The rarity of pups and females in the remaining assemblages may have resulted from a non-breeding colony (at which these two groups seldom occur) being located closer to the sites than the postulated breeding colony.

The single sea lion was an adult male, and the four elephant seals were all subadult males.

Determining the season of year at which fur seals were hunted from their population composition in archaeological sites (Smith 1976: 13-19) is complicated by the hypothesised changes in breeding distribution during the prehistoric period. Seasonal changes in present day fur seal colony population composition result from the migration of adult and subadult males from the breeding range in the south to feeding stations in the north (Wilson 1974:Chapter 6). If, as postulated here and elsewhere (Smith 1978:23, 24),

the breeding range formerly extended to the Coromandel Peninsula and perhaps farther north, then this migration pattern may not have occurred. Thus it would not be wise to assume that the season of prehistoric fur seal exploitation can be determined from present day patterns of population composition.

The only assemblage for which the fur seals offer any clear suggestion of seasonality is level III at Opito. The bones of the foetal pup were almost identical in size to those of a foetal specimen (CZ2208) which was miscarried in late September. A late winter or early spring season for this occupation is also indicated by the presence of a subadult male elephant seal. This species is most common in New Zealand waters during the winter (Gaskin 1972:149). Elephant seals were also found in level IV at Opito, occupation IV at Skippers Ridge, and Sarahs Gully D layer 4. Winter occupation for level II of Sarahs Midden is suggested by the presence of a sea lion, also most common in New Zealand waters at that time of year (*ibid.*:155).

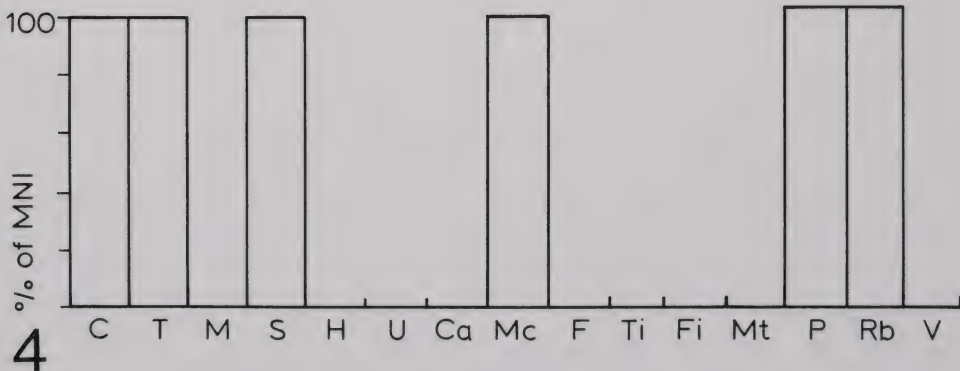
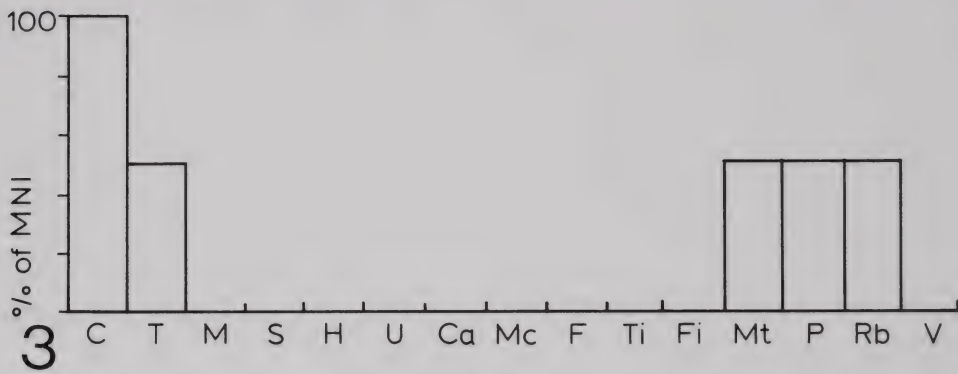
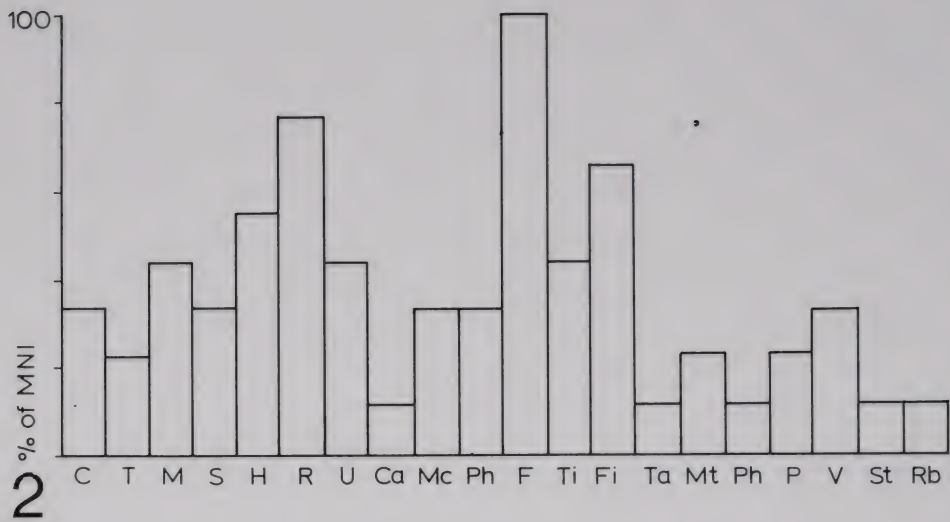
Body parts representation

The proportional representation of body parts (BPR) in the larger assemblages under analysis suggests that complete animal carcasses were not always brought to the site for consumption. In five assemblages the fur seal remains show a marked concentration on the body parts yielding the greatest amount of meat. The BPR in Opito level IV (Fig. 2) shows that the upper hindlimb and upper forelimb are best represented. These body parts yield a large proportion of the meat in a fur seal carcass, while those least well represented — the lower limbs and trunk — yield the least (Smith 1978:20). While differential bone survival (*cf.* Binford & Bertram 1977) and incomplete excavation of the site may have influenced the observed BPR, the most likely explanation for this pattern is that most of the fur seal carcasses brought to the site were incomplete, with the body parts yielding little meat generally being discarded at the butchering site. There is a suggestion in the material from this assemblage that fur seal butchering methods were age or size specific. The majority of trunk and lower limb bones appear to be from smaller individuals, suggesting that they were brought to the site more or less complete, while only the best cuts were taken from larger animals.

Similar patterns were observed in four other assemblages. The two fur seals in the Cross Creek Midden were incomplete, one represented by an upper forelimb and an upper hindlimb, and the other by an upper hindlimb. In both layers of Arthur Black's Midden only forelimb bones were present, and in level III at Opito they were predominant. Fur seal remains in the other assemblages appeared to represent complete or nearly complete carcasses. As these were almost all juvenile animals, the size specific butchering pattern observed at Opito level IV would appear to be confirmed.

All of the elephant seal and cetacean remains indicate that a restricted range of body parts was present in each assemblage. The sea lion in Sarahs Midden level II had all body parts represented.

The dog remains in most assemblages represented complete or nearly complete carcasses, indicating that the animals were butchered and consumed on the site. However in two assemblages a somewhat different pattern was apparent. Sarahs Gully A and B level IV and C layer 3 both contained only those bones which might be expected to be



Figs. 2-4. Proportional representation of body parts. 2. Fur seal Opito level IV. Maximum MNI = 9. 3. Dog, Sarahs Gully A and B level IV. Maximum MNI = 2. 4. Dog, Sarahs Gully C layer 3. Maximum MNI = 1.

C—cranium, T—teeth, M—Mandible, S—scapula, H—humerus, R—radius, U—ulna, Ca—carpus, Mc—metacarpus, Ph—phalanx, F—femur, Ti—tibia, Fi—fibula, Ta—tarsus, Mt—metatarsus, P—pelvis, V—vertebra, St—sternum, Rb—rib.

discarded during the butchering process. A method by which the polynesian dog might have been butchered has been proposed elsewhere (Smith 1981) and involves detaching the fore and hind limbs along with their associated musculature and then flensing the majority of the remaining flesh from the axial skeleton. If this procedure were followed, bones from the head and trunk are likely to have been discarded at the time of butchering. In the two assemblages under consideration (Figs. 3, 4) it is only these bones which occur, and none of the bones which would have been detached along with the flesh are present. Unfortunately none of the other assemblages showed a complementary pattern, with only the fore and hind limb bones present.

Meat weights

The relative importance of each mammalian species as a source of food cannot be calculated simply from their relative abundance in the excavated assemblages. Clearly, larger animals will provide a greater quantity of food per individual than will smaller ones, and an animal represented by a complete carcass more than one represented only by its forelimb. Thus it is necessary to calculate the amount of meat provided by each animal before relative dietary importance can be established.

A number of other factors must also be taken into account before so analysing these assemblages. Several assemblages contained so few bones that serious consideration must be given to the possibility that they derived from other layers in the site, and therefore do not represent food consumed during that occupation. This doubt applies to Opito level I, Sarahs Gully A and B level II, the single fragment of fur seal bone from Sarahs Gully C layer 4 and all of the bone from the upper four layers of Sarahs Gully D. The absence of detailed stratigraphical information for these assemblages makes it impossible to assess the possibility of secondary deposition of this material, and hence no attempt has been made to calculate meat weights in these instances.

A similar problem arises with Skippers Ridge and Sarahs Gully Pa. The dumping of food refuse was not a major activity at either of these sites (Birks & Birks 1960, Davidson 1975), and this is reflected in the virtual absence of bone in any of their layers. Furthermore it has been argued by their excavators, and subsequently, that each of these sites was occupied contemporaneously and in association with nearby beach front middens (Parker 1960, Birks & Birks 1960, Green 1972a, 1972b). Thus it would seem unwise to consider the few mammalian remains in these assemblages as representative of the pattern of exploitation at their time of occupation.

The estimated weight of consumed meat was calculated for nine assemblages (Table 6, Fig. 5). In all but one assemblage sea mammals provided the greatest quantity of meat. Only in Arthur Black's Midden layer 3 did the polynesian dog provide more food. Thus, while dogs generally outnumbered sea mammals, the vastly greater size of the seals and pilot whales resulted in their providing more than 75% of the estimated consumed meat weight. Possible sources of error in these calculations are more likely to have underestimated the dietary contribution of sea mammals than that of dogs, and thus their relative importance may have been greater.

It is not possible to measure the importance of sea mammals relative to other food sources as the non-mammalian fauna from these sites has not been analysed. However the impression conveyed by the few published references to faunal remains is that other food

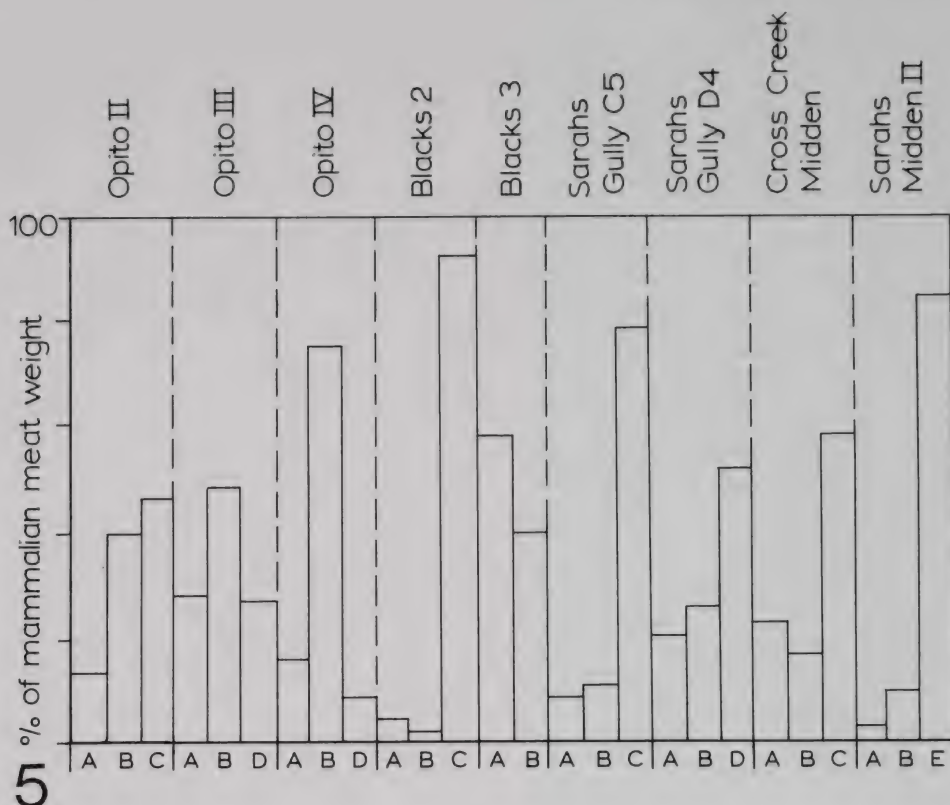


Fig. 5. Meat weights of mammals. A. Dog, B. Fur seal, C. Pilot whale, D. Elephant seal, E. Sea lion.

sources are not likely to have contributed an equivalent quantity of meat. Moas — the only other large animal to have been exploited — were present only in small numbers (Davidson 1979: 87), and the other birds, fish and shellfish present in the middens (Green 1963, Davidson 1979) are of much smaller size, thereby requiring enormous numbers to have been eaten to match the dietary contribution of sea mammals. While conclusions on this matter must await further analysis, comparison with the only other Archaic Coromandel site for which meat weights have been calculated supports the hypothesised pattern. In the lower occupation layer of the Whangamata Wharf site fur seals provided 63.05% of the meat, dogs 21.25%, man 7.5% birds (including Moa) 5.92% and shellfish 0.13% (Allo 1972:72-77).

All of the assemblages for which meat weights were calculated are dated either directly or by their association with Archaic artefacts to the period A.D. 1200-1500. Faunal material from the few post-Archaic assemblages was limited, but as seal and cetacean bone was absent from these it seems possible that sea mammals did not remain as a major food source beyond the 15th or 16th century. A decline in their abundance is also apparent in the upper layers of Tairua (Yaldwyn 1962:263) and Whangamata Wharf (Allo 1972:76-77).

Table 6. Meat weights of mammals.

Species/age group	mni	body parts present	estimated consumed meat weight (kg)	
<i>Opito level II</i>				
Dog: subadult	1	C	6.00	
adult	2	C	12.00	
no indication	1	C	6.00	24.00
Fur seal: juvenile	1	C	14.38	
subad. male	1	C	59.00	73.38
Pilot whale: no indic.	1	? est. 10%		82.96
				180.34
<i>Opito level III</i>				
Dog: juvenile	1	C	3.00	
adult	1	C	7.50	
no indication	3	C	18.00	28.50
Fur seal: pup	1	C	4.82	
juvenile	1	C	14.38	
subad. male	1	2FL	17.70	
ad. female	1	2FL	9.00	
no indic.	1	FL	6.64	52.54
Elephant seal: subad. male	1	? est. 10%		27.63
				108.67
<i>Opito level IV</i>				
Dog: juvenile	1	C	3.00	
subadult	2	C	12.00	
adult	2	C	15.00	
no indication	4	C	24.00	54.00
Fur seal: juvenile	2	C	28.76	
subad. male	4	2C, 2FL, 2HL	147.50	
ad. male	3	3FL, 3HL	70.89	247.15
Elephant seal: subad. male	1	? est. 10%		27.63
				328.78
<i>Blacks Midden layer 2</i>				
Dog: subadult	1	C		6.00
Fur seal: juvenile	1	FL		2.16
Pilot whale: no indic.	1	? est. 10%		82.96
				91.12

Table 6. Continued

Species/age group	mni	body parts present	estimated consumed meat weight (kg)	
<i>Blacks Midden layer 3</i>				
Dog: subadult	1	C	6.00	
adult	1	C	7.50	13.50
Fur seal: subad. male	1	FL		8.85
				22.35
<i>Sarabs Gully C layer 5</i>				
Dog: subadult	1	C	6.00	
no indication	1	C	6.00	12.00
Fur seal: juvenile	1	C		14.38
Pilot whale: no indic.	1	? est. 10 %		82.96
				109.34
<i>Sarabs Gully D layer 4</i>				
Dog: subadult	1	C	6.00	
no indication	1	C	6.00	12.00
Fur seal: juvenile	1	C		14.38
Elephant seal: subad. male	1	? est. 10%		27.63
				54.01
<i>Cross Creek Midden</i>				
Dog: juvenile	3	C	9.00	
subadult	1	C	6.00	
adult	1	C	7.50	
no indication	3	C	18.00	40.50
Fur seal: subad. male	1	FL, HL	14.75	
ad. male	1	FL	14.18	28.93
Pilot whale: no indic.	1	? est. 10%		82.96
				152.39
<i>Sarabs Midden Level II</i>				
Dog: no indication	1	C		6.00
Fur Seal: juvenile	1	C		14.38
Sea lion: adult male	1	C		141.75
				162.13

C=complete, FL=forelimb, HL=hindlimb

CONCLUSION

The mammalian fauna from this group of predominantly Archaic sites exhibits a remarkably consistent pattern which permits some conclusions to be drawn about aspects of prehistoric economy in the area. The hunting of sea mammals was clearly a major activity. Seals and cetaceans were the main providers of mammalian meat, and may well have been the most important food source. Among the sea mammal species, fur seals would have been the most reliable food resource. Their number and regularity of occurrence in the sites indicates that fur seal colonies existed in the Coromandel area during this period. It has been suggested that these included breeding colonies, and if this was so then these animals would have been available for hunting at all times of the year. The elephant seals and the single sea lion are too few in number to suggest the presence of colonies on the Coromandel coast. The animals represented in these sites are likely to have been occasional visitors to the area that were captured when they hauled out on local beaches.

The pilot whale remains probably do not indicate the hunting of whales at sea. Harpoons have not been recorded from the Coromandel area (Duff 1956:223-230), and as natural strandings of this species are common on New Zealand beaches (Gaskin 1968:65) their remains in these sites are likely to have resulted from the butchering of beached animals.

As well as these hunting and 'scavenging' (cf. Smith 1979:219) activities, the raising of domesticated animals for food is evidenced by the dog remains. The presence of this species in every assemblage and in considerable numbers suggests that it was a reliable and commonly eaten food. The high frequency of immature individuals supports this contention.

When the subsistence pursuits pertaining directly to the mammalian fauna are viewed alongside the other activities evidenced for these sites — moa hunting, fowling, fishing, shellfishing and horticulture — a broadly based economic system can be postulated. During the Archaic period the big-game hunting components of this system — sea mammals and moas — appear to have been the central focus. The apparent decline of moa bone in sites beyond A.D. 1500-1600 (Davidson 1979:187), and the absence of sea mammals in the few post-Archaic assemblages considered here would appear to demonstrate a movement away from this focus. Further research on post-Archaic assemblages, and in particular those containing midden components, is necessary to substantiate this contention and explore its implications.

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REFERENCES

- ALLO, J.
 1970 *The Maori Dog: A Study of the Polynesian Dog of New Zealand.* Unpublished M.A. Thesis, University of Auckland.
 1971 The dentition of the Maori dog of New Zealand. *Rec. Auckland Inst. Mus.* 8:29-45.
 1972 The Whangamata Wharf site (N49/2): excavations on a Coromandel coastal midden. *Rec. Auckland Inst. Mus.* 9:61-79.
- BINFORD, L.R., and J.B. BERTRAM
 1977 Bone frequencies and attritional processes. In L.R. Binford (Editor), *For Theory Building in Archaeology.* Academic Press. New York. 419p. pp.77-153.

- BIRKS, L., and H. BIRKS
1960 Pa at Sarahs Gully, Coromandel Peninsula. *N.Z. Archaeol. Ass. Newsl.* 3 (2) :16-20.
- BOILEAU, J.
1980 The artefact assemblage from the Opito Beach midden, N49/3, Coromandel Peninsula. *Rec. Auckland Inst. Mus.* 17: 65-95.
- DAVIDSON, J.M.
1974 A radiocarbon date from Skippers Ridge (N40/7), Opito, Coromandel Peninsula. *N.Z. Archaeol. Ass. Newsl.* 17(1): 50-52.
1975 The excavation of Skippers Ridge (N40/7), Opito, Coromandel Peninsula, in 1959 and 1960. *Rec. Auckland Inst. Mus.* 12:1-42.
1979 Archaic middens of the Coromandel Coast. In A.J. Anderson (Editor), *Birds of a Feather*. B.A.R. International Series 62. 295p. pp.183-202.
- DUFF, R.
1956 *The Moa-hunter period of Maori culture*. 2nd edition. Government Printer, Wellington. 400p.
- GASKIN, D.E.
1968 The New Zealand Cetacea. *Fisheries Res. Bull.* No.1 (n.s.): 1-92.
1972 *Whales, Dolphins and Seals; with special reference to the New Zealand region*. Heinemann Educational Books, Auckland. 200p.
- GOLSON, J.
1959a Excavations on the Coromandel Peninsula. *N.Z. Archaeol. Ass. Newsl.* 2(2):13-18.
1959b Culture change in prehistoric New Zealand. In J.D. Freeman and W.R. Geddes (Editors), *Anthropology in the South Seas . . .* Thomas Avery, New Plymouth. 267p. pp.29-74.
- GREEN, R.C.
1963 Summaries of sites at Opito, Sarahs Gully and Great Mercury Island. *N.Z. Archaeol. Ass. Newsl.* 6(1):57-69.
1964 Source, ages and exploitation of New Zealand obsidian. *N.Z. Archaeol. Ass. Newsl.* 7(3):134-143.
1972a Moahunters, agriculture and changing analogies in New Zealand prehistory. *N.Z. Archaeol. Ass. Newsl.* 15(1):16-39.
1972b Additional evidence for the age of settlements at Sarahs Gully, Coromandel Peninsula. *N.Z. Archaeol. Ass. Newsl.* 15(3):89-93.
- PARKER, R.H.
1960 Reconnaissance at Skippers Ridge. *N.Z. Archaeol. Ass. Newsl.* 3(2):39-41.
- SMITH, I.W.G.
1976 Prehistoric fur seal exploitation on the south west coast of Chatham Island. Unpublished B.A. (Hons.) Dissertation, University of Otago.
1978 Seasonal sea mammal exploitation and butchering patterns in an Archaic site (Tairua, N44/2), on the Coromandel Peninsula. *Rec. Auckland Inst. Mus.* 15:17-26.
1979 Prehistoric sea mammal hunting in Palliser Bay. In B.F. and H.M. Leach (Editors), *Prehistoric Man in Palliser Bay. National Mus. Bull.* 21:1-272. pp.215-224.
1981 Mammalian fauna from an Archaic site on Motutapu Island, New Zealand. *Rec. Auckland Inst. Mus.* 18:95-105.
n.d. Sea mammals and prehistoric subsistence in New Zealand (in preparation). PhD Thesis, University of Otago.
- WILSON, G.J.
1974 The distribution, abundance and population characteristics of the New Zealand Fur Seal (*Arctocephalus forsteri*). Unpublished M.Sc. Thesis, University of Canterbury.
- YALDWYN, J.C.
1962 Faunal material — bone. In C.D. Smart and R.C. Green, A stratified dune site at Tairua, Coromandel. *Dom. Mus. Rec. Ethnol.* 1(7):256-263.